TFT LCD Approval Specification

MODEL NO.: V320B1 - L07

Customer: _____

Approved by: _____

Note:

Approved By	TVHD
	LY Chen

Reviewed By	QRA Dept.	Product Development Div.
	Tomy Chen	WT Lin

Prepared By	LCD TV Marketing and Product Management Div.	
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REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 2.0	Jan. 02,'07	All	All	Approval Specification was first issued.
Ver 2.1	Aug. 06,'07	7	3.3.1	Modify Note of Lamp Life Time Change (4) to "at 25 ºC Lamp Current(HI-Side) 8.2mA"
		9	3.3.2	Cancel CMO INVERTER JIG CHARACTERISTICS
		9~10	5.1	TFT LCD MODULE Pin assignment CN1(XL) Connector Pin Assignment Pin No.: 1~55 → 1~68 CN1(XR) Connector Pin Assignment Pin No.: 1~55 → 1~68
		24~26	12	Modify MECHANICAL CHARACTERISTICS

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V320B1- L07 is a 32" TFT Liquid Crystal Display module with 12-CCFL Backlight unit and RSDS interface. This module supports 1366 x 768 WXGA format and can display true 16.7M colors (8-bit colors).

1.2 FEATURES

-High brightness (400 nits)
- Ultra-high contrast ratio (1200：1)
- Faster response time (6.5ms)
- High color saturation NTSC 75%
- Ultra wide viewing angle：176(H)/176(V) (CR>20) with Super MVA technology
- RSDS (Reduced Swing Differential Signaling) interface
- Color reproduction (nature color)
- Optimized response time for both 50 / 60 Frame rate

1.3 APPLICATION

- TFT LCD TVs
- Multi-Media Display

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	708.954(H) x 398.592 (V) (32.02" diagonal)	mm	(1)
Bezel Opening Area	714.96 (H) x 404.6 (V)	mm	
Driver Element	a-si TFT active matrix	-	
Pixel Number	1366 x R.G.B. x 768	pixel	
Pixel Pitch (Sub Pixel)	0.1730 (H) x 0.5190 (V)	mm	
Pixel Arrangement	RGB vertical stripe	-	
Display Colors	16.7M	color	
Display Operation Mode	Transmissive mode / Normally black	-	
Surface Treatment	Anti-Glare coating (Haze 25%),Hard coating (3H)	-	

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	759	760	761	mm	(1)
	Vertical(V)	449	450	451	mm	(1)
	Depth(D)	43.7	44.7	45.7	mm	
Weight		6500	6700	6900	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	(+50)	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	50	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.0	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

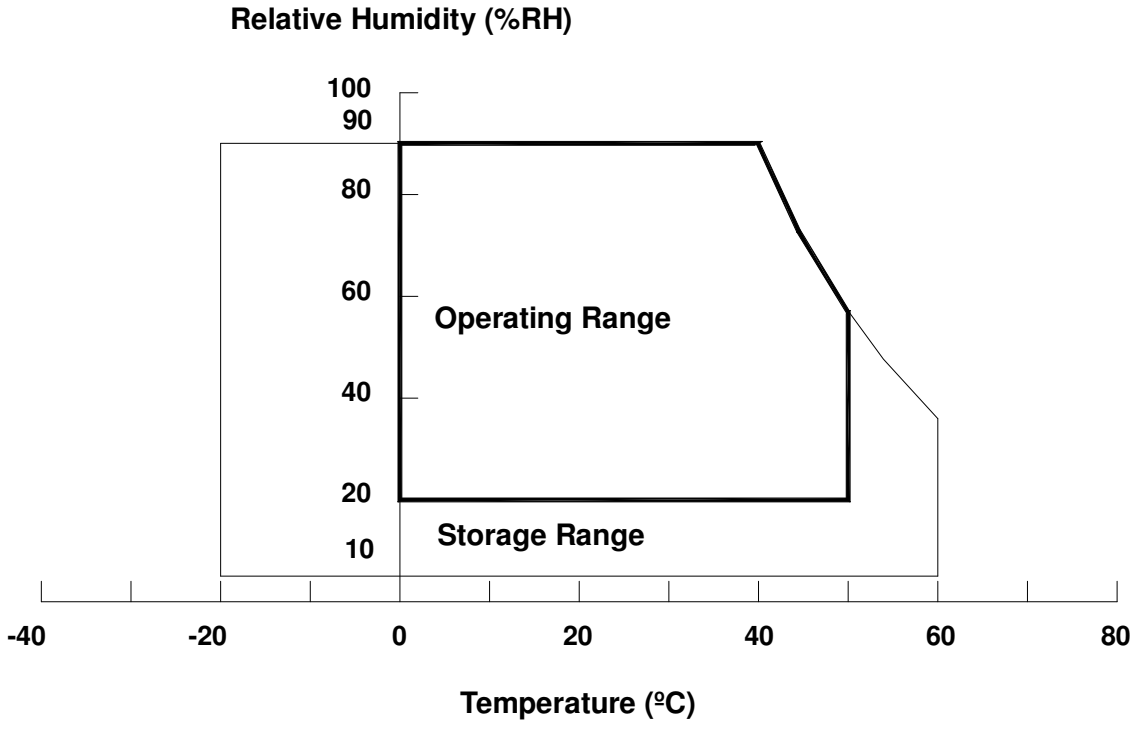
(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 ºC. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 200 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



2.2 PACKAGE STORAGE

When storing modules as spares for a long time, the following precaution is necessary.

(a) Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35℃at normal humidity without condensation.

(b) The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

2.3 ELECTRICAL ABSOLUTE RATINGS

2.3.1 ELECTRICAL ABSOLUTE RATINGS (OPEN CELL)

Item	Symbol	Value		Unit	Note
		Min	Max		
Power Supply Voltage	VAA	-0.3	+14.0	V	(1)
	VGH	-0.3	+30.0	V	
	VGL	-10.0	-0.3	V	
Logic Input Voltage	V_{IN}	-0.3	3.6	V	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

2.3.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V_W	—	3000	V_{RMS}	
Power Supply Voltage	V_{BL}	0	30	V	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under normal operating conditions.

Note (2) No moisture condensation or freezing.

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		VGH	22	23	24	V	
		VGL	-6.0	-5.5	-5.0	V	
		VAA	13.2	13.5	13.8	V	
		V33V	3.1	3.3	3.5	V	
		VREF	12.3	12.5	12.7	V	
Power Supply Current		IGH	-	20	-	mA	
		IGL	-	20	-	mA	
		IAA	-	450	-	mA	
		I3.3V	-	150	-	mA	
CMOS interface	Input High Threshold Voltage	V_{IH}	2.7	-	3.3	V	
	Input Low Threshold Voltage	V_{IL}	0	-	0.7	V	

3.2 RSDS CHARACTERISTICS

Ta = -10~+85 ºC

Item	Symbol	Condition	Value			Unit
			Min	Typ	Max	
RSDS high input Voltage	$V_{DIFFRSDS}$	V_{CMRSDS} = +1.2 V (1)	100	200	-	mV
RSDS low input Voltage	$V_{DIFFRSDS}$	V_{CMRSDS} = +1.2 V (1)	-	-200	-100	mV
RSDS common mode input voltage range	V_{CMRSDS}	$V_{DIFFRSDS}$ = 200mV (2)	VSSD+0.1	Note(3)	VSSD+1.2	V
RSDS Input leakage current	I_{DL}	$D_{xx}P$, $D_{xx}N$,CLKO ,CLPN	-10	-	10	μA

Note (1) V_{CMRSDS} = (VCLKP + VCLKN)/2 or V_{CMRSDS} = ($VD_{XX}P$ + $VD_{XX}N$)/2

Note (2) $V_{DIFFRSDS}$ = VCLKP - VCLKN or $V_{DIFFRSDS}$ = $VD_{XX}P$ - $VD_{XX}N$

Note (3) V_{CMRSDS} = 1.2V(VDDD = 3.3V)

3.3 BACKLIGHT INVERTER UNIT

3.3.1 CCFL (Cold Cathode Fluorescent Lamp) CHARACTERISTICS (Ta = 25 ± 2 ºC)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Voltage	V_W	-	1220	-	V_{RMS}	I_L = 8.2mA
Lamp Current(HI-Side)	I_L	7.7	8.2	8.7	mA_{RMS}	(1)
Lamp Starting Voltage	V_S	-	-	2450	V_{RMS}	(2), Ta = 0 ºC
		-	-	2360	V_{RMS}	(2), Ta = 25 ºC
Operating Frequency	F_O	40	-	70	KHz	(3)
Lamp Life Time	L_{BL}	50,000		-	Hrs	at 25 ºC Lamp Current(HI-Side) 8.2mA

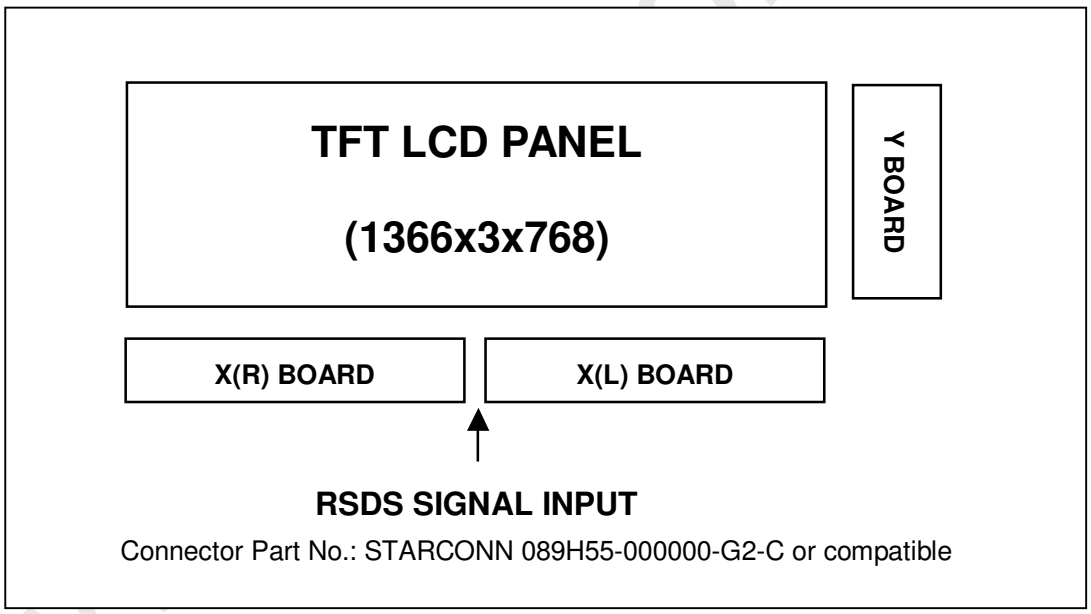
Note (1) The lamp starting voltage V_S should be applied to the lamp for more than 1 second under starting up duration. Otherwise the lamp could not be lighted on completed.

Note (2) The lamp frequency may produce interference with horizontal synchronous frequency of the display input signals, and it may result in line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (3) The life time of a lamp is defined as when the brightness is larger than 50% of its original value and the effective discharge length is longer than 80% of its original length (Effective discharge length is defined as an area that has equal to or more than 70% brightness compared to the brightness at the center point of lamp.) as the time in which it continues to operate under the condition at Ta = 25 ±2℃ and I_L = 7.7 ~ 8.7 mA_{RMS}.

4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



5. PIN CONNECTION

5.1 TFT LCD MODULE

Pin assignment

CN1(XL) Connector Pin Assignment

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	VCM	VCM Power supply	35	GND	Ground
2	VCM	VCM Power supply	36	A_CLKP	Data driver clock
3	GM14	Gamma Power supply	37	A_CLKM	Data driver clock
4	CON2	Gamma Power supply	38	GND	Ground
5	GM13	Gamma Power supply	39	ATP1	A-Path RSDS data latch
6	GM12	Gamma Power supply	40	A_R3P	A-Path RSDS data signal (Red3)
7	GM11	Gamma Power supply	41	A_R3M	A-Path RSDS data signal (Red3)
8	GM10	Gamma Power supply	42	A_R2P	A-Path RSDS data signal (Red2)
9	GM9	Gamma Power supply	43	A_R2M	A-Path RSDS data signal (Red2)
10	GM8	Gamma Power supply	44	A_R1P	A-Path RSDS data signal (Red1)
11	GND	Ground	45	A_R1M	A-Path RSDS data signal (Red1)
12	A_B3P	A-Path RSDS data signal (Blue3)	46	A_R0P	A-Path RSDS data signal (Red0)
13	A_B3M	A-Path RSDS data signal (Blue3)	47	A_R0M	A-Path RSDS data signal (Red0)
14	A_B2P	A-Path RSDS data signal (Blue2)	48	GND	Ground
15	A_B2M	A-Path RSDS data signal (Blue2)	49	VAA	Driver Power supply
16	A_B1P	A-Path RSDS data signal (Blue1)	50	VAA	Driver Power supply
17	A_B1M	A-Path RSDS data signal (Blue1)	51	GM7	Gamma Power supply
18	A_B0P	A-Path RSDS data signal (Blue0)	52	GM6	Gamma Power supply
19	A_B0M	A-Path RSDS data signal (Blue0)	53	GM5	Gamma Power supply
20	A_G3P	A-Path RSDS data signal (Green3)	54	GM4	Gamma Power supply
21	A_G3M	A-Path RSDS data signal (Green3)	55	GM3	Gamma Power supply
22	A_G2P	A-Path RSDS data signal (Green2)	56	GM2	Gamma Power supply
23	A_G2M	A-Path RSDS data signal (Green2)	57	CON1	Gamma Power supply
24	A_G1P	A-Path RSDS data signal (Green1)	58	GM1	Gamma Power supply
25	A_G1M	A-Path RSDS data signal (Green1)	59	STV_R	Scan driver start pulse2
26	A_G0P	A-Path RSDS data signal (Green0)	60	OE	Scan driver output enable
27	A_G0M	A-Path RSDS data signal (Green0)	61	GRL1	Control the direction of start pulse
28	GND	Ground	62	CKV	Scan driver clock
29	DRL1	Control the direction of start pulse for data driver	63	STV	Scan driver start pulse1
30	POL	polarity invert	64	VGL	Driver Power supply
31	V33V	Logic Power supply	65	VGH	Driver Power supply
32	V33V	Logic Power supply	66	GND	Ground
33	ASTH_R	A-Path source driver start pulse2	67	NC	No connection
34	ASTH	A-Path source driver start pulse1	68	TR1	Trace 1

CN2(XR) Connector Pin Assignment

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	VCM	VCM Power supply	35	GND	Ground
2	VCM	VCM Power supply	36	B_CLKP	Data driver clock
3	GM14	Gamma Power supply	37	B_CLKM	Data driver clock
4	CON2	Gamma Power supply	38	GND	Ground
5	GM13	Gamma Power supply	39	BTP1	B-Path RSDS data latch
6	GM12	Gamma Power supply	40	B_R3P	B-Path RSDS data signal (Red3)
7	GM11	Gamma Power supply	41	B_R3M	B-Path RSDS data signal (Red3)
8	GM10	Gamma Power supply	42	B_R2P	B-Path RSDS data signal (Red2)
9	GM9	Gamma Power supply	43	B_R2M	B-Path RSDS data signal (Red2)
10	GM8	Gamma Power supply	44	B_R1P	B-Path RSDS data signal (Red1)
11	GND	Ground	45	B_R1M	B-Path RSDS data signal (Red1)
12	B_B3P	B-Path RSDS data signal (Blue3)	46	B_R0P	B-Path RSDS data signal (Red0)
13	B_B3M	B-Path RSDS data signal (Blue3)	47	B_R0M	B-Path RSDS data signal (Red0)
14	B_B2P	B-Path RSDS data signal (Blue2)	48	GND	Ground
15	B_B2M	B-Path RSDS data signal (Blue2)	49	VAA	Driver Power supply
16	B_B1P	B-Path RSDS data signal (Blue1)	50	VAA	Driver Power supply
17	B_B1M	B-Path RSDS data signal (Blue1)	51	GM7	Gamma Power supply
18	B_B0P	B-Path RSDS data signal (Blue0)	52	GM6	Gamma Power supply
19	B_B0M	B-Path RSDS data signal (Blue0)	53	GM5	Gamma Power supply
20	B_G3P	B-Path RSDS data signal (Green3)	54	GM4	Gamma Power supply
21	B_G3M	B-Path RSDS data signal (Green3)	55	GM3	Gamma Power supply
22	B_G2P	B-Path RSDS data signal (Green2)	56	GM2	Gamma Power supply
23	B_G2M	B-Path RSDS data signal (Green2)	57	CON1	Gamma Power supply
24	B_G1P	B-Path RSDS data signal (Green1)	58	GM1	Gamma Power supply
25	B_G1M	B-Path RSDS data signal (Green1)	59	NC	No connection
26	B_G0P	B-Path RSDS data signal (Green0)	60	VSCM	VSCM Power supply
27	B_G0M	B-Path RSDS data signal (Green0)	61	VREF	Gamma Power supply
28	GND	Ground	62	NC	No connection
29	DRL1	Control the direction of start pulse for data driver	63	STV	Driver Power supply
30	POL	polarity invert	64	NC	No connection
31	V33V	Logic Power supply	65	VGL	Driver Power supply
32	V33V	Logic Power supply	66	GND	Ground
33	BSTH_R	B-Path source driver start pulse2	67	NC	No connection
34	BSTH	B-Path source driver start pulse1	68	TR2	Trace 2

Note (1) CN1、CN2 Connector Part No.: Hirose FH31H-68S-0.5SH(05) or equal.
Note (2) The TR1 must be connected to the TR2.

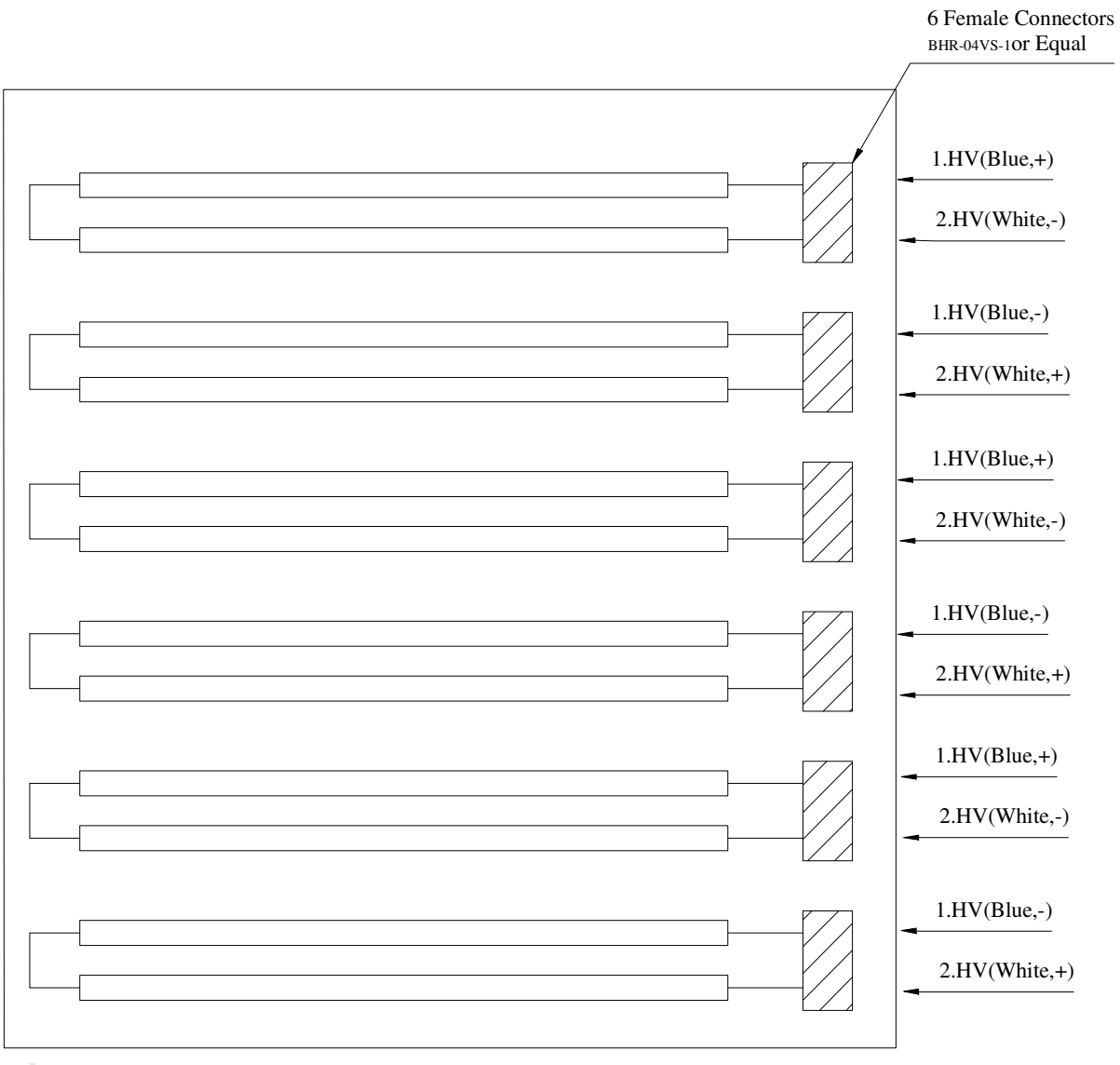
5.2 BACKLIGHT UNIT

The pin configuration for the housing and leader wire is shown in the table below.

CN3-CN10 (Housing): BHR-04VS-1(JST) or equivalent

Pin No.	Symbol	Description	Wire Color
1	HV	High Voltage	Blue
2	HV	High Voltage	White

Note (1) The backlight interface housing for high voltage side is a model BHR-04VS-1, manufactured by JST or equivalent.



5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. INTERFACE TIMING

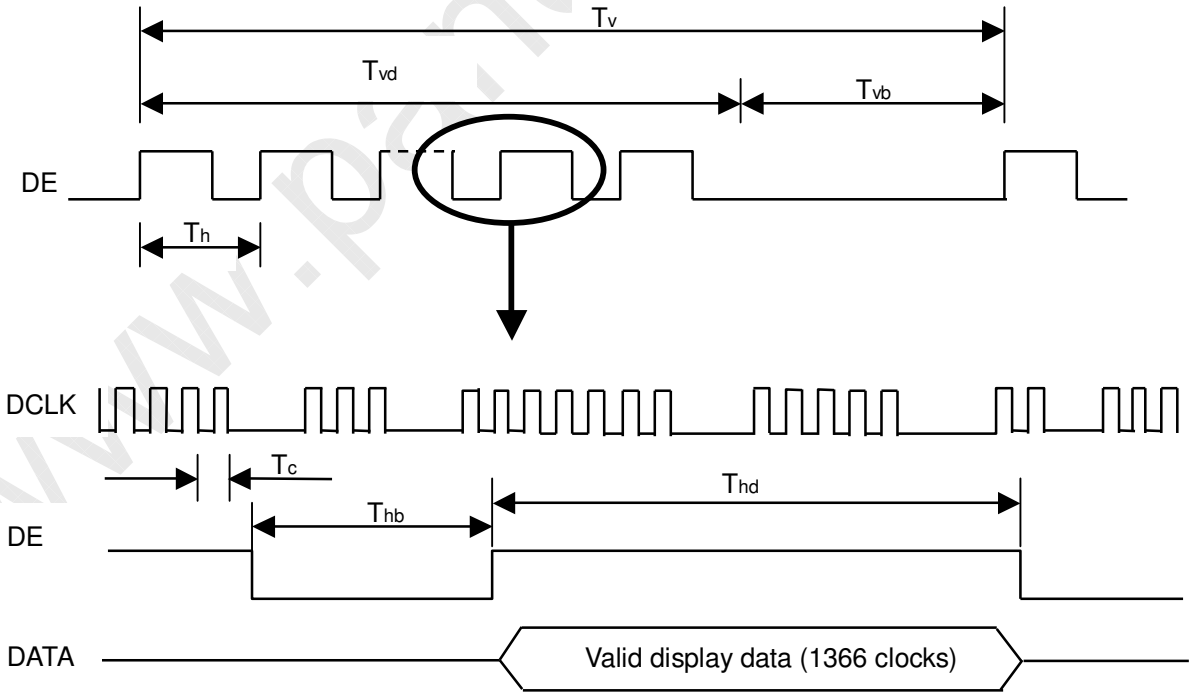
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

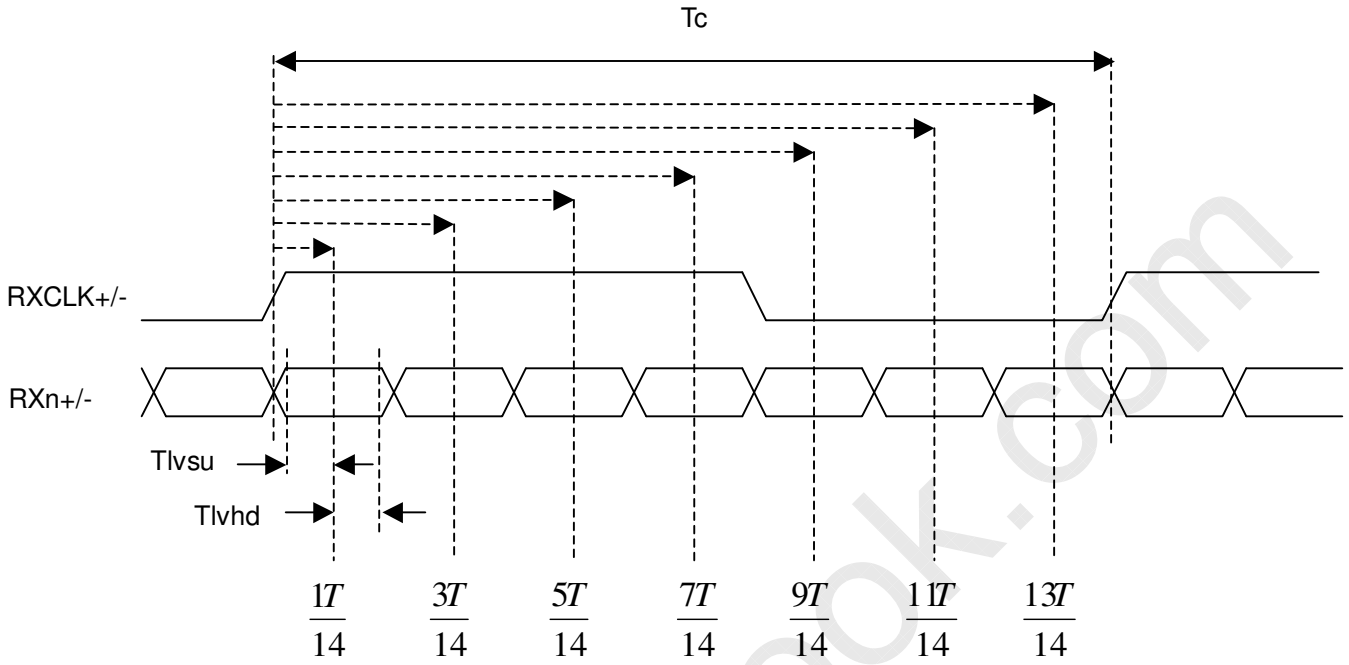
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock	Frequency	1/Tc	60	86	88	MHz	
	Input cycle to cycle jitter	Trcl	-	-	200	ps	
LVDS Receiver Data	Setup Time	Tlvsu	600	-	-	ps	
	Hold Time	Tlvhd	600	-	-	ps	
Vertical Active Display Term	Frame Rate	Fr5	47	50	53	Hz	
		Fr6	57	60	63	Hz	
	Total	Tv	778	795	888	Th	Tv=Tvd+Tvb
	Display	Tvd	768	768	768	Th	-
	Blank	Tvb	10	27	120	Th	-
Horizontal Active Display Term	Total	Th	1442	1798	1936	Tc	Th=Thd+Thb
	Display	Thd	1366	1366	1366	Tc	-
	Blank	Thb	76	432	570	Tc	-

Note: Since this module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM

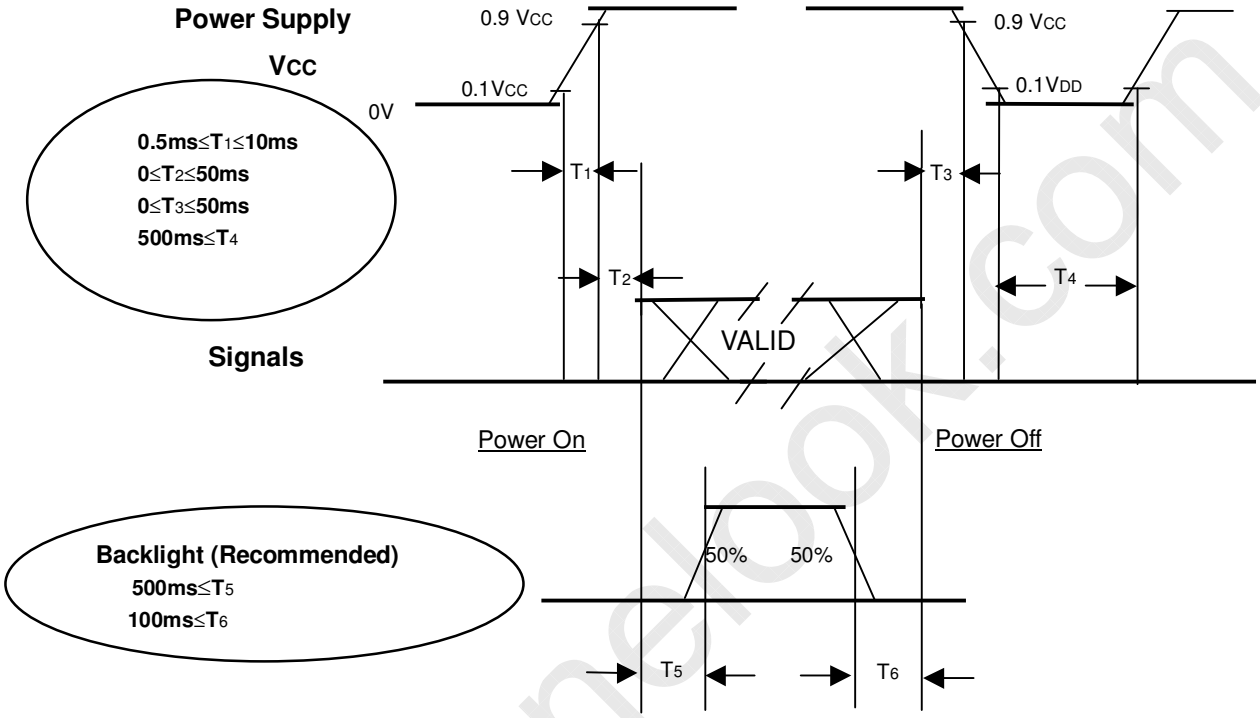


LVDS RECEIVER INTERFACE TIMING DIAGRAM



6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should follow the conditions shown in the following diagram.



Power ON/OFF Sequence

Note.

(1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.

(2) Please apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation of the LCD turns off, the display may, instantly, function abnormally.

(3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.

(4) T4 should be measured after the module has been fully discharged between power on/off periods.

(5) Interface signal shall not be kept at high impedance when the power is on.

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current (High side)	I_L	8.2mA ± 0.5	mA
Oscillating Frequency (Inverter)	F_W	58±3	KHz
Frame rate		60	Hz

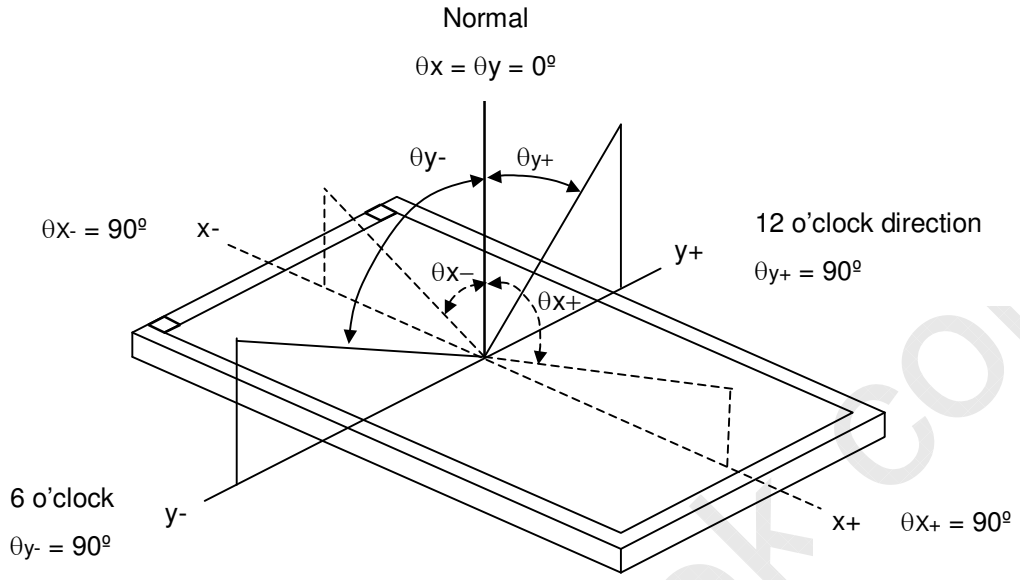
7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_x=0°, θ_Y =0° Viewing Angle At Normal Direction	900	1200	-	-	(2)
Response Time		Gray to gray average		-	6.5	12	ms	(3)
Center Luminance of White		L_C		350	400	-	cd/	(4)
Average Luminance of White		L_{AVE}		300	350	-	cd/	
White Variation		δW		-	-	1.3	-	(7)
Cross Talk		CT		-	-	4.0	%	(5)
Color Chromaticity	Red	Rx		Typ-0.03	0.652	Typ+0.03	-	(6)
		Ry			0.330		-	
	Green	Gx			0.275		-	
		Gy			0.596		-	
	Blue	Bx			0.143		-	
		By			0.063		-	
	White	Wx			0.285		-	
		Wy			0.295		-	
	Color Gamut	CG		72	75		%	NTSC
Viewing Angle	Horizontal	θ_x+	CR≥20	80	88	-	Deg.	(1)
		θ_x-		80	88	-		
	Vertical	θ_Y+		80	88	-		
		θ_Y-		80	88	-		

Note (1) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by EZ-Contrast 160R (Eldim)



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

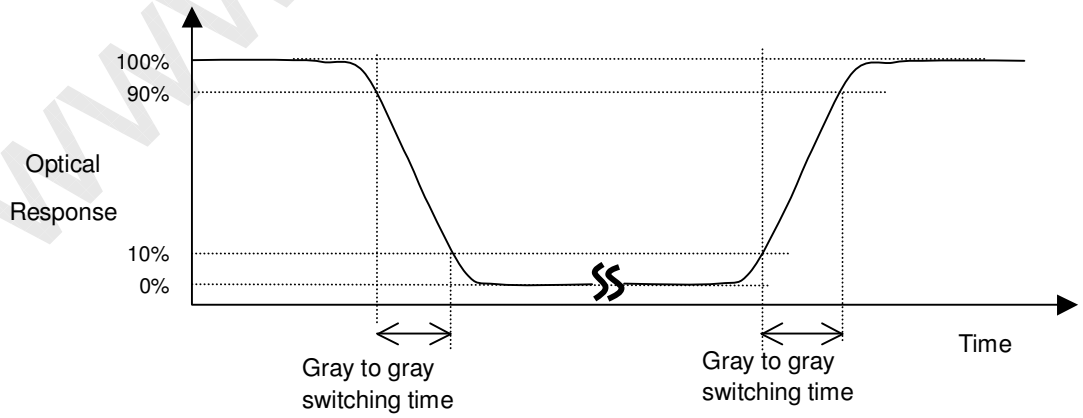
Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (7).

Note (3) Definition of Gray to Gray Switching Time :



The driving signal means the signal of gray level 0, 63, 127, 191, 255.

Gray to gray average time means the average switching time of gray level 0 ,63,127,191,255 to each other .

Note (4) Definition of Luminance of White (L_C, L_{AVE}):

Measure the luminance of gray level 255 at center point and 5 points

$L_C = L(5)$

$L_{AVE} = [L(1)+ L(2)+ L(3)+ L(4)+ L(5)] / 5$

where L (x) is corresponding to the luminance of the point X at the figure in Note (7).

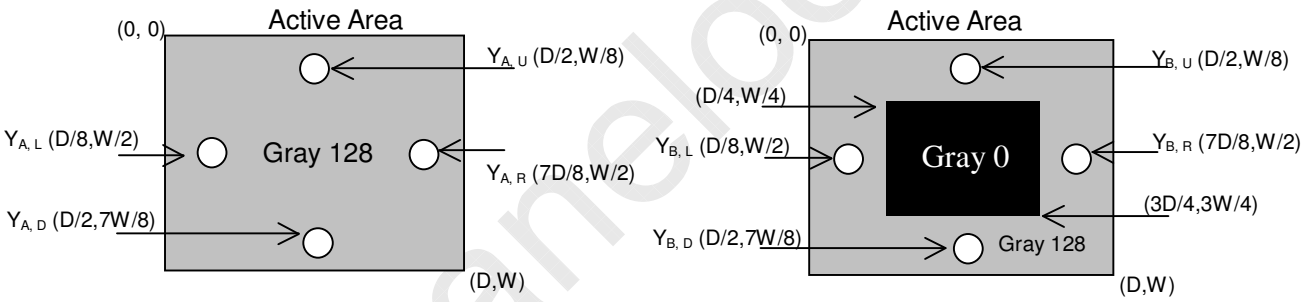
Note (5) Definition of Cross Talk (CT):

$CT = | Y_B - Y_A | / Y_A \times 100\ (\%)$

Where:

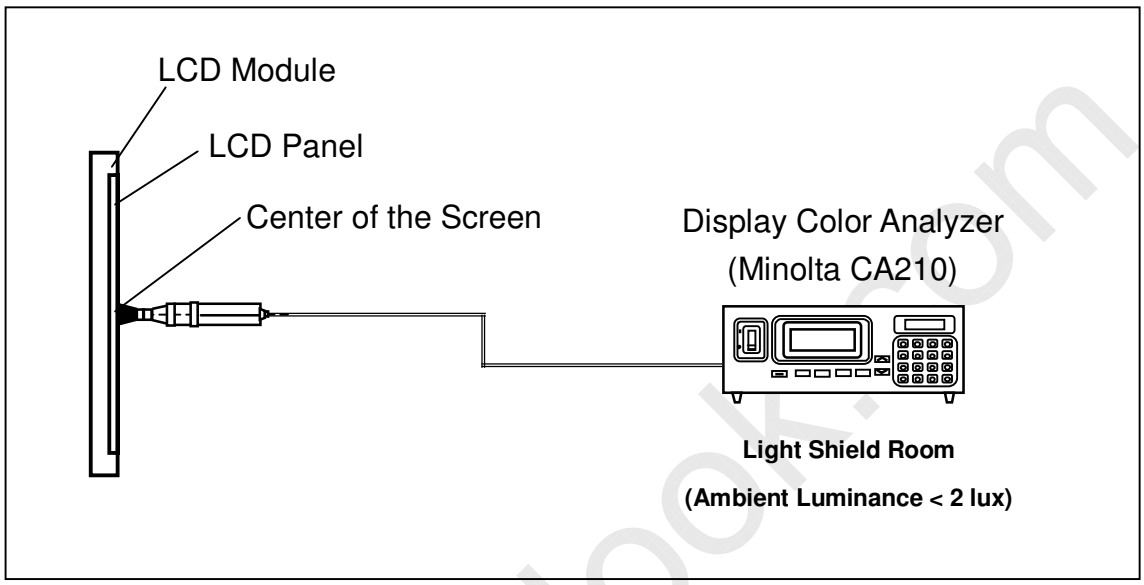
Y_A = Luminance of measured location without gray level 0 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 0 pattern (cd/m^2)



Note (6) Measurement Setup:

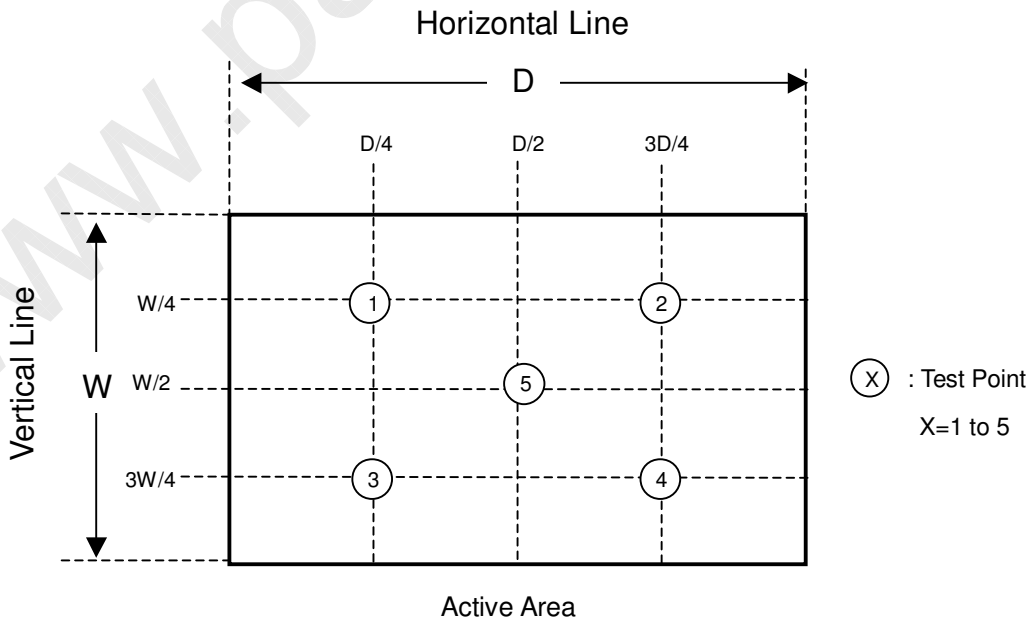
The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

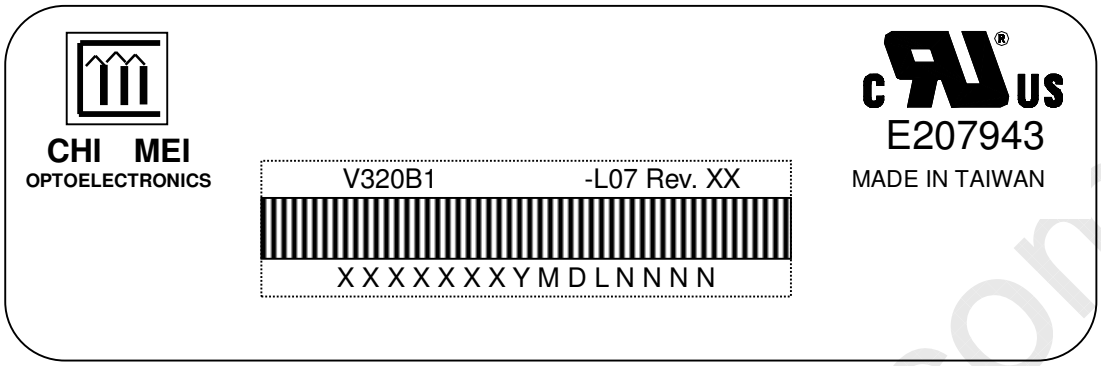
δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



8. DEFINITION OF LABELS

8.1 CMO MODULE LABEL

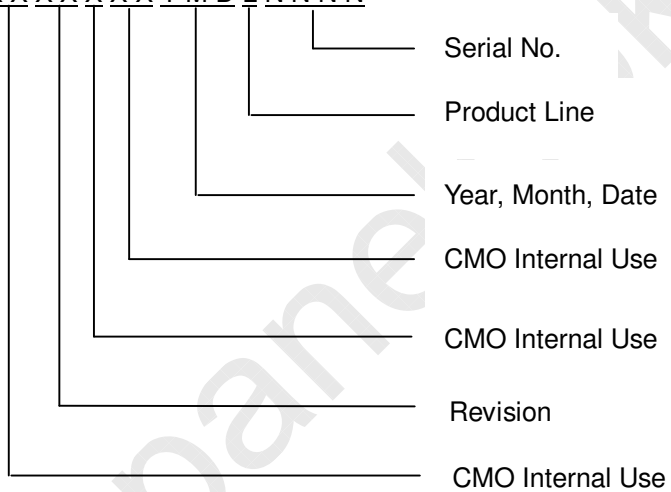
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: V320B1-L07

(b) Revision: Rev. XX, for example: A0, A1… B1, B2… or C1, C2…etc.

(c) Serial ID: X X X X X X X Y M D L N N N N



Serial ID includes the information as below:

(a) Manufactured Date: Year: 0~9, for 2000~2009

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I ,O, and U.

(b) Revision Code: Cover all the change

(c) Serial No.: Manufacturing sequence of product

(d) Product Line: 1 -> Line1, 2 -> Line 2, …etc.

9. PACKAGING

9.1 PACKING SPECIFICATIONS

(1) 4 LCD TV modules / 1 Box

(2) Box dimensions：906(L) X 384 (W) X 580 (H)

(3) Weight：approximately 31.5Kg (4 modules per box)

9.2 PACKING METHOD

Figures 9-1 and 9-2 are the packing method

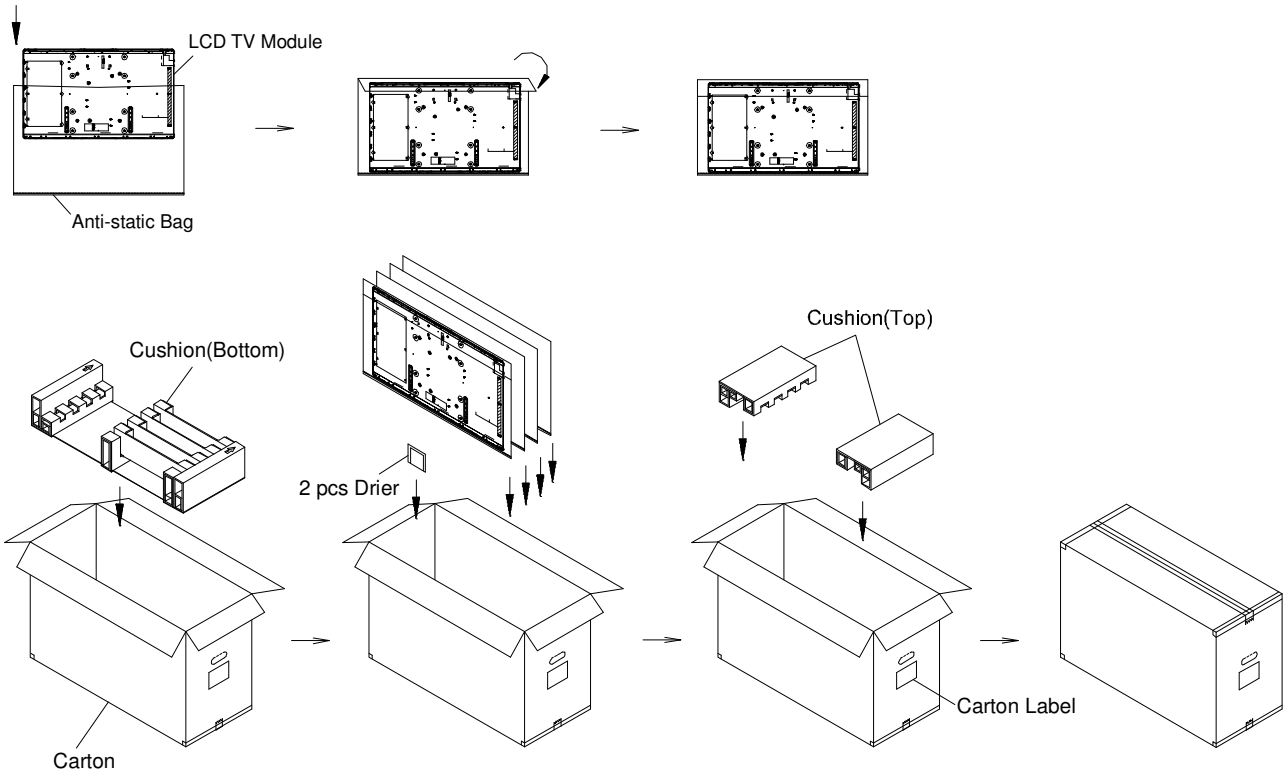
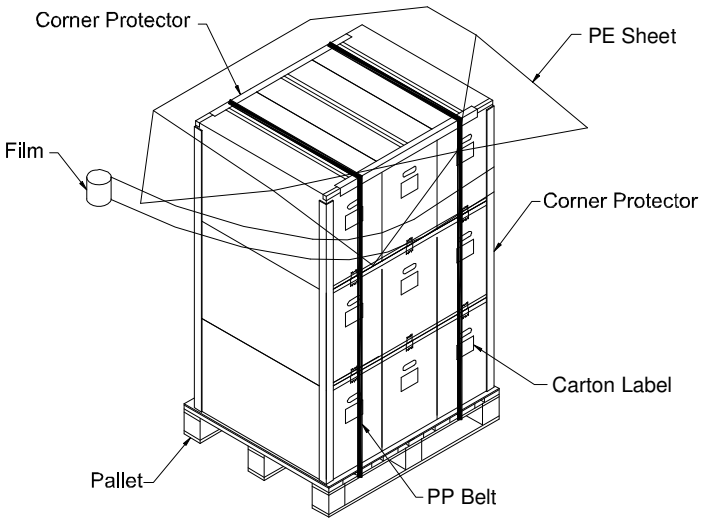


Figure.9-1 packing method

Sea Transportation

Corner Protector:L1130*50mm*50mm
Corner Protector:L1400*50mm*50mm
Pallet:L950*W1180*H140mm
Pallet Stack:L950*W1180*H1880mm
Gross:300kg



Air Transportation

Corner Protector:L1130*50mm*50mm
Pallet:L950*W1180*H140mm
Pallet Stack:L950*W1180*H1300mm
Gross:205kg

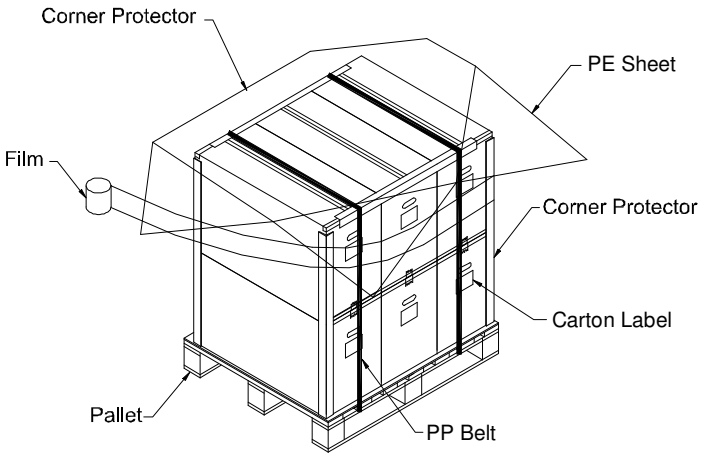


Figure. 9-2 Packing method

10. PRECAUTIONS

10.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) Do not apply pressure or impulse to the module to prevent the damage of LCD panel and backlight.

(4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

(5) Do not plug in or pull out the I/F connector while the module is in operation.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) Moisture can easily penetrate into LCD module and may cause the damage during operation.

(9) High temperature or humidity may deteriorate the performance of LCD module. Please store LCD modules in the specified storage conditions.

(10) When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

10.2 SAFETY PRECAUTIONS

(1) The startup voltage of a backlight is over 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the backlight unit.

(2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(3) After the module's end of life, it is not harmful in case of normal operation and storage.

11. REGULATORY STANDARDS

11.1 SAFETY

Regulatory	Item	Standard
Information Technology equipment	UL	UL 60950-1: 2003
	cUL	CAN/CSA C22.2 No.60950-1-03
	CB	IEC 60950-1:2001
Audio/Video Apparatus	UL	UL 60065: 2003
	cUL	CAN/CSA C22.2 No.60065-03
	CB	IEC 60065:2001

12. MECHANICAL CHARACTERISTICS